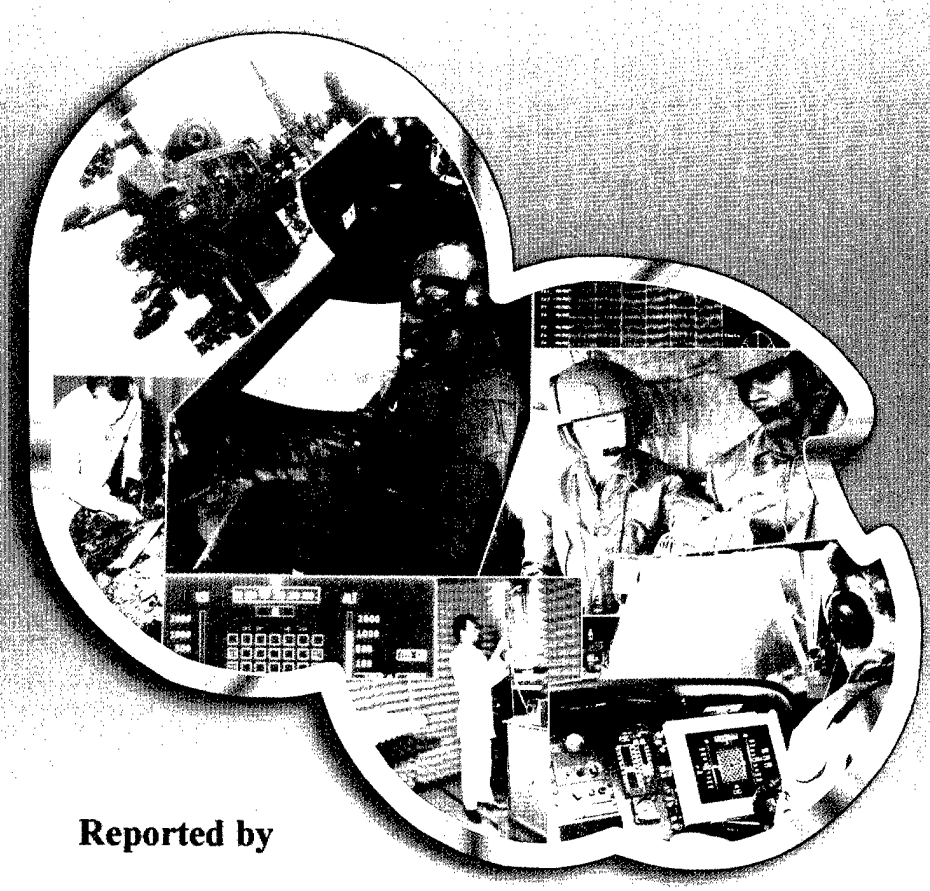
U.S. Army Aeromedical Research Laboratory

Annual Progress Report

Calendar Year 1999



Reported by

John A. Powell, Colonel, MC, MFS

March 2000

USAARL

U.S. Army
Aeromedical Research
Laboratory

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release, distribution unlimited
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) USAARL Report No. N/A	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Aeromedical Research Laboratory 6b. OFFICE SYMBOL (If applicable) MCMR-UAD	7a. NAME OF MONITORING ORGANIZATION U.S. Army Medical Research and Materiel Command
6c. ADDRESS (City, State, and ZIP Code) P.O. Box 620577 Fort Rucker, AL 36362-0577	7b. ADDRESS (City, State, and ZIP Code) 504 Scott Street Fort Detrick, MD 21702-5012
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) (U) U.S. Army Aeromedical Research Laboratory Annual Progress Report	
12. PERSONAL AUTHOR(S)	
13a. TYPE OF REPORT 13b. TIME COVERED FROM Jan 99 TO Dec 99 14. DATE OF REPORT (Year, Month, Day) 2000 March 15. PAGE COUNT 61	
16. SUPPLEMENTAL NOTATION	
17. COSATI CODES FIELD / GROUP / SUB-GROUP	18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Annual Progress Report, CY99

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The Annual Progress Report gives the CY99 personnel and funding strength of the U.S. Army Aeromedical Research Laboratory. This report includes an overview of the Laboratory activities, current areas of research, and a brief description of the research being conducted.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Chief, Science Support Center	22b. TELEPHONE (Include Area Code) (334) 255-6907	22c. OFFICE SYMBOL MCMR-UAX-SS

DD Form 1473, JUN 86 *Previous editions are obsolete.*

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

Table of contents

Table of contents (continued)

BACKGROUND

The U.S. Army Aeromedical Research Laboratory (USAARL) was established in 1962 to accomplish research in support of Army aviation and airborne activities, and to provide a central aeromedical research and reference library. In 1974, medical research programs in acoustics and vision were added to the Laboratory's mission. USAARL's mission was further expanded in 1977 to include the assessment of health hazards and research in support of both air and ground vehicles and weapons systems. In spite of this mission expansion, USAARL's primary mission remains medical research support of Army aviation.

Scientists and engineers assigned to USAARL seek to enhance force effectiveness by preventing or minimizing health hazards created by military systems, doctrine and tactics. Specifically, they identify, investigate and solve medical and health-related problems which deter soldiers/aviators from performing their mission or compromise their safety. Co-location with the U.S. Army Aviation Center allows USAARL's unique mix of scientific personnel to successfully conduct critical research for solving operational medicine problems for our aviators. Additionally, USAARL provides military developers with information and expertise to enhance the performance and safety of future Army systems.

USAARL maintains close coordination with other services and the international allied medical research community as a member of the North Atlantic Treaty Organization (NATO) Research and Technology Organization (RTO) and the Triservice Aeromedical Research Panel (TARP).

This report presents an overview of USAARL activities during calendar year 1999 (CY99), identifies current areas of research, and gives a brief description of the research programs being conducted.

MISSION

USAARL conducts research and development on health hazards of Army aviation, tactical combat vehicles, selected weapons systems, and airborne operations. Assesses the health hazards from noise, acceleration, impact, and visual demands of such systems and defines measures to offset hazards. Assesses stress and fatigue in personnel operating these systems and develops countermeasures. Assists in development of criteria upon which to base standards for entry and retention in Army aviation specialties. Assists other U.S. Army Medical Research and Materiel Command (USAMRMC) laboratories and institutes research on the impact of continuous operations on individual and crew performance and development of improved means of patient evacuation. Assesses current life support equipment to identify causes of failure and devises improved design. Assists the combat developers and materiel developers of new Army aviation and tactical combat vehicle systems to recognize and eliminate health hazards as early as possible in the developmental cycle. Conducts collaborative research with other Department of Defense and federal agencies on medical research and development issues of common concern.

FROM THE COMMANDER

The U. S. Army Aeromedical Research Laboratory (USAARL) is proud to present this summary of achievements for calendar year 1999. This year our personnel made significant contributions to Army readiness through the continued accomplishment of our research mission.

USAARL continues to distribute the popular brochure Asleep at the Throttle to requestors worldwide. This informative brochure is of great value to the aviation community.

We are in the process of publishing two additional brochures entitled The Eyes Have It and Fly By Night. The Eyes Have It is a 10-page, illustrated guide that presents an overview of the causes and effects of eye injuries in a brief and entertaining fashion. Fly By Night, also a 10-page brochure, illustrates how to overcome difficulties in sleeping due to rotating work hours in the aviation community.

Spatial disorientation (SD) training profiles using the flight simulator have been developed at USAARL to give aviators the necessary experience to take proper corrective action in disorienting events. SD scenarios are now incorporated into instructor flight training across the spectrum, with presumed inclusion in initial entry rotary-wing training.

A review of past and on-going helmet-mounted display (HMD) research was completed to identify potential sources of performance degradation and health hazards. While recognizing the importance of acoustical and biodynamic issues, the major focus was on optical and visual issues. The Laboratory has continued basic flat panel research with the intent of transitioning the approach to applied, in-flight examination of flat panel technology currently being flown under high intensity operational conditions.

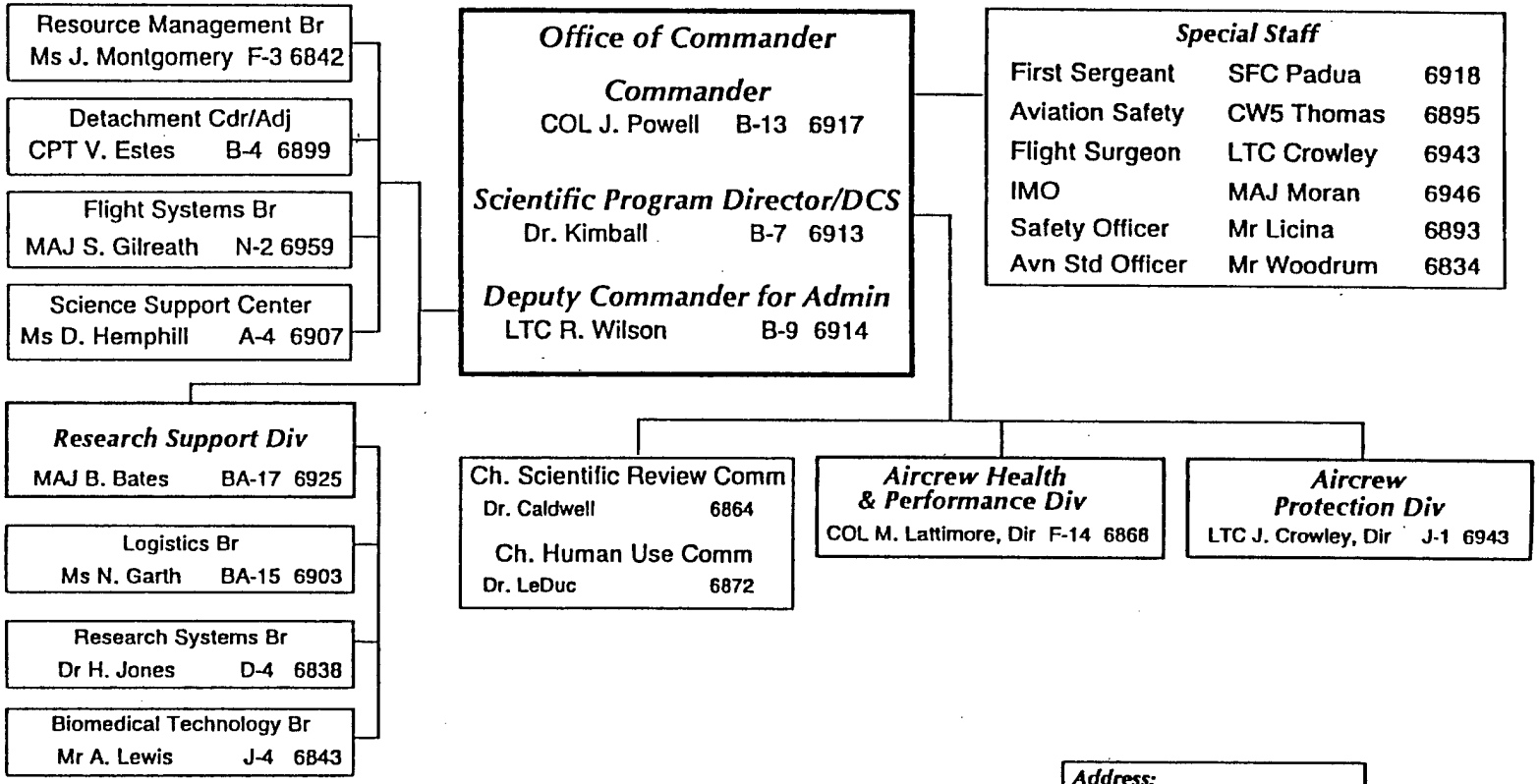
In support of the Program Manager, Aircrew Integrated Systems, considerable effort was expended during 1999 on the UH-60 Cockpit Airbag Systems (CABS). Five studies were designed to assess the risk, both to aircrew and aircraft, associated with unnecessary, or inadvertent, deployments of the prototype airbags.

In-flight versus simulator performance was addressed in a study comparing flight maneuvers in sleep-deprived individuals. Data from both platforms showed their performance under Dexedrine was better than placebo; however, only half of the maneuvers showed consistent, statistically significant stimulant/fatigue effect in both flight platforms. Measurement sensitivity was lower in the aircraft, likely because of error variance due to environmental influences (weather, temperature, and turbulence) and other factors (radio traffic and anxieties about safety).

USAARL remains dedicated to the support of our customer, the combat soldier aviator. We are proud of the singular work we have accomplished on their behalf and dedicate ourselves to this continuing mission.

JOHN A. POWELL
Colonel, MC, MFS
Commanding

United States Army Aeromedical Research Laboratory
Fort Rucker, Alabama 36362-0577



Miscellaneous Numbers

Charge of Quarters (24 hrs) (334) 255-6920/6938		Library (research)	6936
Budget Office	6842	Manpower Office	6840
EEO Coordinator	6827	MARS Facility	6990
Flight Simulator	(334) 598-5078	PSNCO	6886
		Training NCO	6940
		Visual Information	6934

Address:
P.O. Box 620577 - Bldg 6901
Fort Rucker, AL 36362-0577
Phone:
Commercial (334) 255-xxxx
DSN 558-xxxx
FAX no:
Commercial (334) 255-6937
DSN 558-6937

PERSONNEL

As with the majority of organizations, USAARL continues to be impacted by downsizing within the Government. Loss of manpower authorizations and requirements, both military and civilian, deletes critical scientific skills and intensifies the disparity between required and authorized strength levels. In order to meet continuing mission demands in light of these staffing limitations, in addition to the work force described below, USAARL had 5 overhires, 5 terms, and a monthly average of 15 non-TDA personnel during CY99. Non-TDA personnel include Army student contractors, Army Research Office personnel present under the Summer Faculty and High School Math and Science Teachers Programs, and other on-site research and research support contractor personnel, exchange officers and casual officers.

Required strength was 31 officers, 2 warrant officers, 39 enlisted, and 78 civilians, for total requirements of 150. Authorized were 18 officers, 2 warrant officers, 31 enlisted, and 37 civilians for a total authorized strength of 88. The average assigned strength was 15 officers, 2 warrant officers, 29 enlisted, and 41 civilians, for a total average assigned strength of 87.

USAARL employs a highly skilled and trained work force with 67 percent of assigned employees possessing degrees. The types of degrees held by Laboratory employees as of 31 December 1999 were: 5 M.D.s, 11 Ph.D.s, 1 O.D., 17 Masters, 24 Bachelors and 6 Associate degrees.

Equal Employment Opportunity (EEO) Program:

Black Employment Program: USAARL provides a primary representative to the Fort Rucker Black Employment Program Committee (BEPC). This committee provides a forum to consider employment issues affecting blacks in the work force. The committee also works to develop and propose methods to overcome any identified barriers to employment, promotion, training, status, and recognition.

Black Civilian Employees: Three black females received an "A" performance evaluation with a pay for performance. In addition, a Time Off Award (TOA) was awarded to one black female. One class was attended (locally) as compared to three training courses

(two local and one TDY) in CY98. As of 31 December 1999, there were 46 civilian employees--4 black, for a representation of 8 percent.

Hispanic Civilian Employees: USAARL has no Hispanic employees at this time.

Handicapped Civilian Employees: USAARL has no handicapped employees at this time.

Women Civilian Employees: As of 31 December 1999, there were 21 female employees out of 35 permanent civilians, 6 overhires, and 5 term employees, for 46 percent of the 46 total employees.

Of the 10 female employees rated, 9 received an "A" evaluation and 1 received a "B" evaluation.

Forty-nine classes were taken (8 local and 41 TDY) as compared to 68 courses (43 local and 25 TDY) in CY98.

Federal Women's Program. USAARL's last representation was July 1998.

Personnel Achievements:

Promotions: The military staff earned 7 promotions in CY99 ranging from E-3 to colonel. The civilian staff had one promotion of a white male to Inventory Management Specialist, GS-9. Two white females were promoted to Research Psychologist, GS-8, and Secretary (OA), GS-05.

Awards: USAARL's highly motivated, productive staff was recognized for performance in CY99 with:

Military awards:

Army Good Conduct Medal	2
Army Commendation Medal	4
Army Achievement Medal	7
Legion of Merit	3
Total	16

Civilian Awards: USAARL had an active awards program in CY98 with:

40 Pay for Performance A's
3 Pay for Performance B's
10 Time Off Awards
2 On-the-Spot Awards
4 Civilian of the Quarter Awards with TOAs
2 Superior Civilian Service Awards
1 Civilian of the Year Award with TOA

Year 2000 (Y2K) Compliance

USAARL transitioned smoothly into the new millennium despite intense concern over Y2K. Y2K is simply the inability of a computer device to distinguish between 1900 and 2000, causing some systems to malfunction and cease operating. This transition went even more smoothly than the most optimistic predictions. During the approximately 18-month ordeal, monthly and then bi-weekly meetings were held between the USAMRMC and subordinate research laboratories. All individuals collaborated to share experiences and information among themselves as we attempted to harness this problem.

During the course of the year, USAARL replaced 27 personal computers that failed a Y2K software test, rewrote software codes in numerous computer programs, and tested over 250 medical maintenance devices. Additionally, all facility devices that either had an embedded computer chip or were controlled/monitored by a computer chip were fully functional on New Year's Day. These systems included: boiler/water heater, chiller, generators, heating and ventilation system, fire alarm system, water and plumbing, and elevators.

100-Megabyte Computer Network

Y2K in the broader context was responsible for the evaluation of computer systems and pushed technology issues to the forefront of discussion. One of the benefits was a newly designed network that will operate at 100-megabit or 10 times the speed of our current coaxial 10Base2 network. At present, over 14,000 linear feet of fiber optic and Category 5 twisted-pair cabling has been installed. This cabling initiative, coupled with our newly installed Dell 400Mhz dual processor exchange servers, will increase productivity by reducing the amount of time to access information or work with large graphic files.

Enhanced Video Teleconferencing

Three key video teleconferencing (VTC) devices were procured that greatly enhance our ability to conduct VTCs to a large audience and provide detailed analysis of graphical representations. A Proxima infrared remote control projector was installed in the Command Conference Room. The Proxima provides automatic color focus and zoom with a resolution of 800 video lines. The Proxima projects onto a newly acquired 52-inch Sony projection television. Previously, VTCs were limited to an audience of five or six people. We now possess the capability of presenting VTCs to an audience of 25 or more.

Finally, a Canon Mark II Video Visualizer gives us the ability to clearly enlarge and project photographic or digital graphics up to 10X, allowing the receiving audience to view our research slides clearly and accurately.

Microsoft Exchange Migration

An ambitious project was undertaken by the U.S. Army Medical Department during the 3rd and 4th quarters of FY99 to migrate all commands to Microsoft Exchange mail. USAARL played a major role during this migration, which began with the implementation of two Dell 400Mhz processors. Programming involved four concentrated efforts: first, new electronic mail addresses had to be created for all employees and added to the AMEDD Global Address Book; second, public folders and official distribution lists were created both inter- and intra-command; then batch archiving of existing mail messages had to imported into new personal folders; and finally, all Laboratory personal received 4 hours of classroom instruction. Although both complicated and tedious, the migration went quite smoothly.

SCIENTIFIC PROGRAMS

USAARL scientific research encompasses three of USAMRMC's major research areas. They are systems health hazards, hazards of mechanical forces, and combat crew effectiveness. Under each of these research areas, USAARL has established scientific programs which are directed at fulfilling either an Army Science and Technology Objective (STO) or a USAMRMC Science and Technology Execution Plan (STEP).

Titles, the DA Form 1498 accession number, and the USAARL division with the responsibility for these projects are listed below.

TITLE	DA ACCESSION NUMBER	DIVISION
Aeromedical Research of Operationally Significant Problems in the Army Aviation Environment	DA0G0151	Aircrew Health and Performance
Coping Strategies for Helicopter Pilots and Crews Involved in Night Operations	DA335655	Aircrew Health and Performance
Enhancement of Aviator Sleep and Performance Through Chemical Intervention	DA336185	Aircrew Health and Performance
Investigation of Spatial Disorientation and Related Topics	DA336186	Aircrew Health and Performance
Research Countermeasures for Significant Medical Hazards and Crew Life Support in Military Systems	DA0G0165	Aircrew Health and Performance
Military Visual Performance	DA361539	Aircrew Health and Performance
Military Visual Problems: Assessment, Mechanisms, and Protection	DA0B6893	Aircrew Health and Performance
Visual Performance Issues of Flat Panel Technologies	DA336445	Aircrew Health and Performance

Methodologies for Assessing Retinal and Visual Functions	DA336446	Aircrew Health and Performance
Mechanism of Melatonin Action on Military Performance	DA360560	Aircrew Health and Performance
Aviator Status Monitoring	DA361534	Aircrew Health and Performance
Physiological and Performance Effects of Extended Operations and NBC Environments on Aviators	DA360559	Aircrew Health and Performance
Evaluation of Refractive Error Correction Methodologies and Military Implications	DA306074	Aircrew Health and Performance
Aviation Epidemiology Data Register	DA308727	Aircrew Protection
Rotary-Wing Aircraft Impact Protection Strategies	DA302870	Aircrew Protection
Biodynamics of Life Support Equipment and Personnel Armor	DA0G0167	Aircrew Protection
Auditory Performance Standards	DA361536	Aircrew Protection
Biomechanical Assessment of Human Tolerance of Transient Acceleration and Impact in the Military Rotary-Wing Environment	DA320693	Aircrew Protection
Repeated Impact Tolerance Criteria for U.S. Army Ground Vehicles	DA336192	Aircrew Protection
Develop Criteria, Models and Evaluation Methodologies to Improve Aviator Communication Performance and Hearing Protection	DA360347	Aircrew Protection
Medical Equipment Airworthiness Certification Evaluations	DA361537	Aircrew Protection
Head Supported Mass Effects on Soldier Performance and Injury	DA361535	Aircrew Protection

MANAGEMENT ACTIVITIES

Technology Transfer:

USAARL maintained an active technology transfer program in CY99 through distribution of its technical reports, publication in the open literature, presentations to military and civilian audiences, execution of Cooperative Research and Development Agreements (CRDAs), and membership in federal, regional, and state technology transfer organizations.

A CRDA between USAARL and Purdue University Department of Psychology was executed in CY99 for cooperative investigation of hierarchically ordered information in intelligent multifunction displays (MFDs). MFDs are gradually being introduced into military helicopters; therefore, future aircraft will be increasingly dependent on computers. Studies have shown that poorly designed MFDs have significant impact on user satisfaction and performance. The purpose of this CRDA is to extend theoretical analysis of hierarchy search into a methodology for gathering data and building a hierarchy layout that minimizes the time needed to find items in a hierarchy. Research findings resulting from this ongoing collaboration have been published in USAARL Technical Report 99-20, A Software Tool for the Design of Multifunction Displays.

USAARL CRDA partners in CY99 are:

BCI International - for collaborative research, development, test and evaluation on BCI International pulse oximeters.
Bethel College - for collaborative development of a high performance liquid chromatographic method for determination of normal and elevated levels of melatonin in saliva.
H. Koch & Sons - for collaborative research on advanced aircrew restraint systems.
Heartstream - for collaborative research, development, and test and evaluation on aeromedical equipment.
Honeywell - for collaboration in visual testing of image intensifier components and systems.
ITT Defense - for collaborative research in visual testing of image intensifier components and systems.
Medical University of South Carolina Department of Ophthalmology - for research and development on visual performance issues in aviation.

PhysioControl Corporation - for collaborative research, development, and test and evaluation of the LifePak 10.
Purdue University - for collaborative research in hierarchically ordered information in intelligent multifunction displays.
Rush Sport Medical - for development of advanced helmet technologies.
Simula Technologies, Inc. - for research in advanced aircrew protection systems.
SpaceLabs Medical Corporation - for collaborative research, development, and test and evaluation on aeromedical equipment.

Science Support Center:

The Science Support Center (SSC) library provided the information necessary to support the aeromedical research performed at USAARL, supported three Flight Surgeon Courses and one Aeromedical Psychologist Course, and disseminated scientific information to requesters worldwide. The library holdings are believed to comprise the most comprehensive aviation medicine collection in this part of the country.

Audiovisual and editorial services contributed to the publication of USAARL technical reports and open literature publications. These services also produced video documentaries, brochures and pamphlets describing research conducted by USAARL.

Resources Management:

Program funding for FY99/00 (dollars in thousands):

	FY99	FY00
6.1 Basic Research	340	340
6.2 Exploratory Development	3,905	4,887
6.3 Advanced Technology Development	634	597
6.4 Demonstration & Validation	0	38
Other	155	153
TOTAL	5,034	6,015

Flight Activities:

Aviation research/research support was provided by six active duty Medical Service (MS) Corps aviators assigned to USAARL, two Department of the Army civilian aviators (one standardization instructor pilot/instrument examiner and one instructor pilot), and one chief warrent officer (CW5) (aviation safety officer). The majority of assigned aviators fly multiple aircraft for research support. Flight Systems personnel participated in aircraft and simulator research flight protocols, and helped recruit subject aviators from other commands.

Assigned aerial research platforms (TDA authorized items) in CY99 were:

JUH-1H	71-20033
JUH-60A	88-26069
NUH-60FS	85-00009 (Research Flight Simulator)

Flight Hours in USAARL platforms in CY99 were:

JUH-1 and JUH-60A	303.0
Simulator	662.7

Simulator and peripherals utilization other than flight: 2129.7 hrs.

During CY99, USAARL aviation platforms were used for the following:

Airworthiness Certification, Aviation Life Support Equipment Retrieval Program (ALSERP), Modafinil, Spatial Disorientation, VIP Spatial Disorientation Demonstration, Temazepam, Panoramic NVG (PNVG), Cockpit Airbag System, Aircrew Coordination, Power Management, Safety Center Support, Research Support, Tactile Situational Awareness System, Monocular NVG (PVS14), Flat Panel, Bifocal Contact Lens, Heads Up Display, Sleep Deprivation and Spatial Disorientation, and TH-67 Spatial Disorientation.

Flight Systems personnel also supplied critical information in the development of a U.S. Army Safety Center Power Management video.

Several significant events had major impact on USAARL flight activities in CY99. Two major Safety of Flight messages on the UH-1H grounded the aircraft for most of the year. This affected the flying hours and protocol productivity in this airframe. The UH-60 went through major maintenance and was grounded from May to August, having three mandatory modifications installed to update the aircraft with the rest of the fleet. The UH-60 then went into its scheduled maintenance phase, keeping it unflyable for a period of 1 month (from late September to the middle of October). Even with the down times, USAARL exceeded normal flying hours.

Standardization/Aircrew Training Program

Five aviator personnel turnovers occurred at USAARL this year. All were experienced aviators and very little training was required. Two aviators went through UH-60 refresher training, one required UH-1 refresher training, and two required mission

training. Twenty-two instrument and contact flight evaluations were administered, in addition to 14 no-notice, pilot-in-command, and instructor pilot evaluations. A total of 320 hours were flown in maintaining flight proficiency for research support.

Flight Systems continued its role of consulting and coordinating with USAARL research divisions in developing and supporting flight research protocols.

Flight Systems also was involved in external commitments and consultations, with personnel attending or tasked to support the following:

Army-wide Simulation, Training and Instrumentation Command (STRICOM) Synthetic Flight Training Systems (SFTS) Conference
USAARL Process Improvement Group for Research Support
Directorate of Training, Doctrine, and Simulation (DOTDS) Aircrew Coordination Council
Interservice/Industry Training, Service and Education Conference (IITSEC)
Aeromedical Aspects of Aircrew Training Workshop
Participation in Airworthiness Certification coordination meetings (AMCOM)
Pre-Command Course briefings on Airworthiness Certification Evaluation (ACE) Program
U.S. Army Aviation Center (USAAVNC) Safety and Standardization Council
Aircraft Logistics Management Division (ALMD) support missions
Army Medical Department (AMEDD) Evacuation ICT
Medical Command (MEDCOM) Aviation Safety and Standardization Council

Personnel Research/Research Support Dedicated Hours

Research Support	1,991
Research Flight Support	165
Airworthiness Certification Evaluation (ACE) Program	88
Sleep Deprivation	66
Spatial Disorientation	165
Telemetry	124
Tactile Situational Awareness System (TSAS)	23
Cockpit Airbag System (CABS)	463
NVD Evaluations	86

Total Research Manhours for CY99: 3,171

During CY99, many distinguished visitors, from general officers to foreign officials, were given demonstrations of the spatial disorientation scenarios, thus enhancing their situational awareness of what their aviators can expect when exposed to SD.

Training:

USAARL's training program for CY99 included 49 training experiences. Training encompassed supervisory development training, software training, training required by Equal Employment Opportunity mandates, and training to assist employees to perform more effectively in their current positions.

RESEARCH ACTIVITIES

Aircrew Health and Performance Division:

Aeromedical Factors Branch:

Aircrew Endurance and Sustainment

During 1999, the Sustained Operations Team completed several projects related to the maintenance of aviator performance during continuous and sustained operations. The first protocol to be completed was an assessment of the stimulant dextroamphetamine as a fatigue countermeasure throughout 64 hours of sustained wakefulness. This study, which evaluated the flight performance of helicopter pilots under dextroamphetamine and a no-treatment control, indicated that the medication effectively sustained flight performance at normal levels throughout the sleep-deprivation period. There were no noteworthy side effects associated with the dextroamphetamine administration. The second study was a fatigue countermeasure investigation that entailed using the new psychostimulant modafinil to preserve the performance of sleep-deprived aviators throughout a 40-hour sustained-operations scenario. This evaluation, which included flight performance assessments as well as tests of mood and physiological alertness levels, indicated that modafinil is an effective fatigue countermeasure, but that it produces side effects (vertigo and nausea) which need to be explored further before the compound can be used in operational contexts. The third major effort was a quasi-experimental comparison of the effects of modafinil to those of the more commonly-known stimulant, dextroamphetamine. This statistical comparison of flight, EEG, and mood data collected under both stimulants suggested that there were comparable effects in terms of maintaining acceptable wakefulness despite significant sleep loss.

The products stemming from these projects and other work in USAARL's sustained operations research program include a variety of papers and presentations. Presentations on the efficacy of stimulants and strategic napping were made at the NATO Research and Technology Organization workshop on sleep/wakefulness management, and the effects of stimulants on aviator performance and sleep architecture were presented at the Aerospace Medical Association, the Operational Aeromedical Problems Course, the Associated Professional Sleep Societies conference, and the National Academy of Sciences workshop on sustainment of performance.

Instructional courses on fatigue management were given at the Aviation Precommand Course, the Aviation Psychology Course, the Flight Surgeon's Course, the International Helicopter Society meeting, and elsewhere.

Technical reports, scientific papers, or articles on fatigue management, the efficacy of modafinil for sustaining aviator performance, and the efficacy of dextroamphetamine for preserving performance in sustained operations, have been prepared, published, or accepted for publication.

In addition, expert consultations on the impact of fatigue and the implementation of fatigue management strategies have been provided for Army, Air Force, and civilian communities.

Coping Strategies for Shiftlag/Jetlag

Mission-driven changes in work schedules and rapid deployment can produce stress, fatigue, and sleep deprivation that limit aircrew performance and impede the accomplishment of Army aviation missions. The Aviation Shift-Lag team develops countermeasures to maintain aviator performance which are implemented and tested in both laboratory and field environments. This team, when required, may consult with aviation units in the field, study work schedules and environmental conditions, evaluate crew rest plans, and educate commanders in new strategies which can be used for future operational and training deployments.

In 1999, several projects were begun to investigate problems with working night shift and possible countermeasures to address these problems. A questionnaire was completed in which three units from three U.S. Army posts were surveyed to document how these aviation units work night shift. Based on the results of this survey, countermeasures will be formulated to help soldiers cope with working nights. A study is currently underway which investigates the ability of temazepam to improve daytime sleep and lead to improved alertness and performance of aviators working night shift for 3 consecutive nights. In addition, field studies are planned to document work/rest cycles of units who train and work night shift. A brochure also has been developed to teach aviators how to sleep during the day and stay alert at night. The Precommand Course and the Flight Surgeon Course include these topics as well.

Crew Coordination

Over 70 percent of rotary-wing accidents can be attributed, at least in part, to human error. Over half of these accidents involve at least one crew coordination failure. These failures typically involve poor coordination of actions due to miscommunication or no communication among the aircrews. Unfortunately, these mishaps continue to plague the military community, even during routine training missions.

In 1999, the verbalizations of 100 videotaped simulator sessions were scored and analyzed to generate a baseline profile of crew communications against which other crews can be compared. Based on Predmore's model of crew resource management analysis, a USAARL-applied rotary-wing format for Coordination Index Rating of Crew Linguistic Events (CIRCLE) yielded subjective, quantified performance measures related to eight crew coordination basic qualities: 1) Establishing and maintaining team leadership and crew climate; 2) Possessing appropriate decision-making techniques; 3) Prioritizing actions and distributing workload; 4) Ensuring statements are clear, timely, relevant, complete, and verified; 5) Maintaining mission situational awareness; 6) Communicating and acknowledging decisions and actions; 7) Seeking supporting information and actions from the crew; and 8) Offering supporting information and actions. Technical reports are being drafted to describe the normative database and its applicability.

Communications Earplug

A study was conducted to assess the effectiveness of the communications earplug (CEP) on crew coordination, and the statistical analyses (currently being applied to the baseline data) will be applied to the CEP study data. The 160th SOAR (Special Operations Aviation Regiment) and baseline normative samples are also being reanalyzed using the quantifiable system. It is expected that regression analyses of the normative data will reveal a limited sample of verbal pairings that may be predictive of relative "good" versus "bad" crew coordination, which would then lend to its independent application in the field.

Miscellaneous Aeromedical Human Factors

Aeromedical human factors include a vast number of practical issues of importance to Army aviation units and personnel for preventing aircraft accidents and for achieving maximum performance during physically and psychologically demanding mission scenarios. Hot weather is an example of an environmental stressor that can adversely affect aviator endurance and flight performance. Heat stress during aviation operations in hot weather areas is a potential hazard that can limit mission duration. In support of the Program Manager, Aircrew Integrated Systems, two research studies using USAARL's UH-60 research flight simulator were published, which evaluated the effects of heat stress on aviators encumbered in one of two Air Warrior MOPP4 ensembles. The addition of a microclimate cooling subsystem to the aviator ensemble appears to be an effective method for reducing the physiological and psychological effects of heat stress in both Air Warrior ensembles.

Visual Sciences Branch:

Mechanism Assessment of Military Visual Problems

The variability of eye positions relative to the faceplate of laser protective eyewear was unknown for U.S. Army personnel. This information was critical in determining the effectiveness of various laser protection designs. A study was conducted to determine this variability using USAARL personnel wearing an advanced sun, wind, and dust goggle. The U.S. Army Aviation Research, Development, and Engineering Center, in coordination with the U.S. Army Aviation Technical Test Center, requested USAARL evaluate theoretical and actual multifunction colored displays in UH-60L and CH-47SD aircraft for Night Vision Imaging System (NVIS) compatibility according to Military Specification MIL-L-85762A and TECOM (TOP) 7-2-513. A laboratory and flight assessment of the feasibility of using a monocular AN/PVS-14 Night Vision Device (NVD) was conducted using UH-60 and AH-64 helicopters. A paper covering a literature review and laboratory and flight assessments on the effects of yellow visors was presented at the Annual SAFE conference. At the request of PM Night Vision, and in coordination with the Aviation Training Brigade, USAARL conducted ground, flight, and maintenance assessments of two different advanced objective lenses for the Aviator's Night Vision Imaging System (ANVIS). At the request of Night Vision Electronic Sensors Directorate, in coordination with the Aviation Training Brigade, USAARL evaluated advanced 100-degree horizontal field-of-view Panoramic Night Vision Goggles

(PNVGs) during routine NVG training missions, in the Laboratory, and in the UH-60 flight simulator. Modifications to the NVD Test Set (TS-3895A/UV) were developed at USAARL to provide collimation assessments for the monocular AN/PVS-14 and the PNVG.

Spatial Disorientation

Spatial disorientation (SD) is a contributing factor in as much as 30 percent of all Army helicopter accidents. USAARL's SD team directs its efforts at reducing the incidence of SD in Army aviation thereby enhancing flight safety and operational effectiveness. The SD research approach has always been comprised of three components: (1) analysis of aviation accident data to determine pilot, cockpit, mission, and environmental factors associated with SD; (2) evaluation of aids to prevent or help overcome SD in flight; and (3) development of new training and instructional methods to enhance pilot and command understanding and awareness of SD.

As part of the continuing evaluation of factors associated with SD, a standardized spatial disorientation flight profile was designed and tested. USAARL's UH-60 simulator is able to produce visual-vestibular mismatches that give what appears to be faulty information to the sensory systems. These mismatches occur during flight and disorient the aviators. The final report of this study sets normative recovery times for the visual-vestibular mismatches. A second study was conducted using the mismatch flight profile to assess the impact of fatigue on recovery from in-flight disorientation. Aviators had a much more difficult time recovering from the mismatches when fatigued. Additionally, the aviators' ability to fly maneuvers such as hovers and low level flight was seriously degraded following sleep loss. Over 50 percent of U.S. Army rotary-wing accidents occur during these two maneuvers. A final report is in progress.

Refractive Error Correction Methodologies and Military Implications

Advanced technologies have now been applied to the refractive error and spectacle incompatibility problem of modern visionic and electro-optics systems. While incisional refractive error correction methods (i.e., radial keratotomy (RK)) have proven to have major problems in the military setting, no such problems have yet been documented by laser techniques (i.e., photorefractive keratectomy (PRK) and laser in-situ keratomilieusis (LASIK)). Given the FDA approval of routine PRK treatment of simple and astigmatic

myopes up to a -6.00 diopter correction, and planned approval for the treatment of hyperopia, individuals having received this treatment prior to military service will be entering service in ever-greater numbers. During 1999, the Surgeon General approved a waiver option for soldiers entering the service with PRK or LASIK. Special Operations Forces and Army aviation are expected to eventually allow these procedures. Therefore, it is imperative that a proactive research program examining the potential benefits and liabilities of this treatment be established.

Several scientific presentations and two open literature manuscripts on corneal thickness, physiology, and function secondary to PRK treatment and postoperative healing were completed. The implications of these corneal thickness data analyses have led to the development of possible recommendations regarding PRK procedure improvement. Additional corneal modeling of the PRK-ablated lenticule and the long term healing response are ongoing. A newly planned protocol will model corneal anterior and posterior surface altitude maps, as well as thickness maps, in keratoconus patients. A study was conducted on the accuracy of videokeratoscopes and their potential use in corneal optics research and as screening devices for refractive surgery patients among aviator recruits.

Visual Performance with Electro-Optical Displays

In 1999, visual performance researchers developed a preliminary design of a field portable image quality tester for the Apache helmet mounted display. A second protocol was written investigating the effects of helmet-mounted-display field-of-view configurations on target acquisition. The concept phase of the laser based virtual retinal display being developed by Microvision, Inc. was evaluated for optical and visual performance. Work was continued on the development of two international standards for integrated helmet-mounted-display and flat-panel-display design critera.

A theoretical analysis of current performance figures of merit (FOMs) based on cathode ray tube displays was conducted. These FOMs were investigated for their applicability to displays based on new pixilated flat panel technologies. A protocol has been approved for studies of the effect of field-of-view display modes on target acquisition performance. These studies will address issues related to performance questions of planned Army binocular helmet-mounted display systems. A book was written which addresses optical, visual, biodynamic, human factors, and acoustical performance parameters of rotary-wing helmet-mounted displays.

Military Visual Tests and Retinal Function

Selection and retention of aviation personnel is based on acceptable performance on a number of vision tests. While visual acuity remains the cornerstone of vision assessment, subtle visual loss can escape detection with standard measures of acuity. USAARL scientists have continued development of the small letter contrast test for use in studies of visual function. The test has been used by all three services for assessment of refractive surgery outcomes. Unlike most clinical color tests, which simply indicate the presence of a color anomaly, this new diagnostic approach reveals type (red, green, or blue) and severity of color deficiency. This approach, which has proven to be more sensitive than standard tests for detecting color deficiency, recently was published in the open literature. Additional research is seeking to correlate clinical retinal status (anatomy and physiology) to abnormal visual test outcomes using the scanning laser ophthalmoscope in order to model predictive performance regarding visual function, and determine how operational equipment artefactually affects actual visual performance (e.g., decreased fields-of-view and decreased resolution). The same technology that permits retinal assessment also lends itself to applied telemedicine investigations.

Aircrew Protection Division:

USAARL's Aircrew Protection Division (APD) comprises a team of engineers, aviators, and health care professionals. The team studies the effects of exposure to physical forces (e.g., noise, repeated impact and jolt, and impact decelerations) on the health and performance of Army air and ground combat crewmembers. It studies communication performance and causes of injury and attrition. These efforts are accomplished through computer modeling, laboratory simulation, use of crash manikins and human volunteers, investigation of mishaps, study of combat crew life support equipment, and access to crewmember health and injury databases. Team members recommend injury prevention strategies to equipment developers and major commands.

Acoustics

The results of a survey of 500 OH-58D aviators supplied with the communications earplug (CEP) were published (USAARL Reports 2000-04 and 2000-05). The reports indicated that the CEP provides improved noise reduction and exceptional communications capability. The respondents claimed that their performance improved significantly, while their workload and stress levels were reduced. While a small group of users within this sample indicated some difficulties (less than 10 percent), the vast majority found that the CEP integrated into their operational activities very well. A new protocol designed to evaluate the CEP in hearing impaired aviators was written and is awaiting scientific and human-use review. A draft of a report describing the noise hazard associated with inadvertent deployment from the Cockpit Airbag System (CABS) has been completed and is under review.

Of note was the recruitment of a new Primary Investigator (PI) to replace an established PI who retired. A new Science and Technology Experimental Plan (STEP) was drafted outlining the vision of the new PI. Statements of work have been submitted for a (noise) health hazard assessment of a helicopter-mounted weapon system, and noise attenuation measurements of a new aviator helmet. Several equipment upgrades (hardware and software) have been initiated by the new PI. Additional research is being planned to study speech intelligibility in noisy environments, evaluate auscultation in the rotary-wing aircraft environment, and evaluate the hearing protection provided by combinations of helmets and earplugs in light of current American National Standards Institute (ANSI) methodology.

Development of ALSE and Crashworthiness Design Standards

Supporting the developers of Army aircraft systems and personal protection devices is an on-going consultation and testing effort at USAARL. Protective systems and devices include crashworthy seats, airbag restraints, conventional restraint harnesses, inertia reels, and protective headgear. Through reconstruction of crashes, static and dynamic testing of systems and devices, and the use of manikins and human volunteers, experts derive protection standards and propose product improvements to developers.

In 1999, USAARL researchers conducted a weight and center of mass assessment of the head borne components of the BASIC P3I Antipersonnel Mine Protection System. The Body Armor System, Individual Countermine, Preplanned Product Improvement (Basic P3I) is an integrated, outerwear clothing system designed to provide ballistic and blast protection against antipersonnel mines.

Acceleration Injury Assessment: Crash manikin

Health hazards encountered in Army systems include whole-body acceleration and blunt impacts that can produce skeletal and internal soft tissue injuries. One way that USAARL assesses these hazards is by using crash manikins and anthropomorphic test devices that faithfully reproduce the human biodynamic response to impact. When subjected to impact tests, data from these devices are processed and evaluated to estimate the risk of injury to the exposed soldier. USAARL has developed a manikin with internal data acquisition system (MIDAS) to improve spinal vertical response. In 1999, USAARL participated in a full-scale drop test of a composite UH-60 fuselage at NASA Langley Research Center (LRC). In addition to fostering cooperative research with NASA LRC researchers, USAARL's goal was to subject MIDAS to realistic crash conditions to evaluate its performance as a test device. Data recorded from the test were sent back to NASA for analysis and comparison to other recorded data from the drop test.

UH-60 Cockpit Airbag System (CABS) Research Program

In support of the Program Manager, Aircrew Integrated Systems, considerable effort was expended during 1999 on the UH-60 Cockpit Airbag System (CABS). Five studies were designed to assess the risk, both to aircrew and aircraft, associated with unnecessary, or inadvertent, deployments of the prototype airbags.

The first of these studies was designed to investigate how often aircrew members are "out of position," or away from their normal upright flying position. Videotapes of 12 1-hour training missions flown in the USAARL NUH-60 simulator were reviewed. When aviators appeared to move outside the resting "flight" position, the nature and destination of the movements were recorded. Results showed that the total proportion of time spent reaching for various control consoles ranged from 1.8 percent to 5.2 percent. Also, copilots in instrument flight conditions spent the greatest proportion of their time reaching, and pilots in visual flight conditions spent the least.

A second study investigated the degree of interaction between the front seat occupants of a UH-60 and a set of statically inflated airbags. Subjects were seated in the cockpit of a CABS-equipped UH-60 and the airbags were slowly inflated. Measurements then were made of the clearance (or contact) between the subjects and the airbags. Results showed aviators' chests and outboard arms to be at the greatest risk of contact. The risk to the outboard arms was of particular concern because significant contact occurred during normal operation of the collective control. The degree of contact was taken as a qualitative estimate of injury potential.

In a third study, prototype UH-60 airbags were deployed in live tests to assess the risk of injury to the cockpit occupants. In these tests, USAARL's midsize crash manikin and an instrumented arm (attached to an Air Force small female manikin) were used as human surrogates. Data from these tests indicated an unacceptable risk of upper extremity injury, particularly for left seat occupants, due to interaction with the prototype lateral airbag. These tests were critical in revising the design of the lateral airbag module to reduce the risk of injury to the arm. The new design will be tested by USAARL, and the results will benefit the OH-58D Kiowa CABS design, currently in progress.

A fourth study assessed the aviator's ability to maintain flight control in the event of an in-flight activation of the prototype UH-60 CABS. Inadvertent CABS deployments were simulated in USAARL's NUH-60 research flight simulator. Thirteen current and qualified UH-60 aviators flew 1-hour simulator missions during which simulated inadvertent deployments were introduced. Aircraft flight parameters and subjects' recovery times after each deployment were among the data gathered. Test results suggested a high probability of crashing if the prototype CABS were to activate during high speed, low altitude flight.

In the last study conducted in 1999 in support of the PM-ACIS UH-60 CABS program, USAARL investigated the aviator's ability to maintain flight control during an inadvertent

activation of a frontal-airbag-only system. In this study, 11 qualified UH-60 aviators flew 1-hour sorties in the NUH-60 research flight simulator during which inadvertent deployments of the frontal airbags were simulated. No subjects "crashed" as a result of these modified simulated deployments. These test results suggested that uncommanded collective motion, which was included in the previous study but removed from this one, played a large part in the high incidence of "crashes" observed in the previous flight control study.

Effects of Head-Supported Weights on Army Warfighters

Army aviation and infantry soldiers use head-supported devices (HSDs) in many training and combat scenarios. If not properly designed, HSDs can degrade the soldier's performance and increase the risk of chronic and acute neck injuries. Researchers at USAARL recently concluded that weight-moment of HSDs worn by male aviators should not exceed 83 Newton-centimeters (N-cm). In 1999, a USAARL study identified a safe range of weight and centers-of-mass of HSDs that can be tolerated by female aviators without affecting their health or degrading their performance. The study involved 12 subjects who were exposed to whole-body vibration (WBV) while wearing HSDs with various mass properties. During sinusoidal WBV exposure, head pitch, anterior-posterior, and axial accelerations were recorded. Neck muscle activities and performance responses were also recorded under a simulated helicopter WBV environment. Results indicated that head pitch and axial acceleration levels for female subjects were lower than those of their male counterparts. This may be attributed to differences in seat damping characteristics between the male and female studies, as well as gender differences in neck muscle density. It was found that negative loading had a detrimental effect on female but not on male aviators. Results also showed a significant increase in magnitude of head pitch acceleration when the weight moments were increased beyond 91 N-cm, a threshold slightly higher than, but comparable to, the 83 N-cm recommended for the male aviators. Based on the biomechanical response alone, USAARL researchers could not recommend design criteria of HSDs mass properties for female that are different than those for male aviators. Further analysis of the physiological and performance responses will be carried out for final recommendation. In the area of injury risk assessment during impact to the head, USAARL has used the most recent acute neck injury criteria to evaluate the effects of cockpit airbags on a UH-60 occupant. These criteria have been recently proposed and used by the U.S. Government and by the automotive industry, but have not been fully validated nor widely accepted. USAARL plans to evaluate the applicability of these

criteria to cockpit airbags, infantrymen head/neck impacts, and parachute-opening shock, particularly when the soldiers are wearing helmets and head-supported devices.

Standard for Health Hazard Assessment of Repeated Jolt in Army Vehicles

In 1997, USAARL concluded a 5-year research program that documented human whole-body response to repeated jolt. The research, which was done under contract with British Columbia Research Inc., established safe tolerance thresholds that would be considered hazardous by current standards. The effort also resulted in a new model for health hazard assessment (HHA) that is designed to replace the current ISO standard for repeated jolt. While the new model requires additional field-testing before it gains users' acceptance, there is little doubt that the USAARL-produced data have raised the bar well above current conservative limits. The impact of this program is likely to affect how the Army evaluates whole-body vibration, particularly when the vibration signature contains high levels of repeated jolts. In 1998, an ANSI workgroup (WG 87, Human Response to Repetitive Mechanical Shock) was formed under the S3 committee (Bioacoustics) to deliberate, refine and establish a new standard that is relevant to Army tactical vehicles. A parallel ISO workgroup was convened to deliberate and introduce an annex to the ISO 2361 standard. This annex is in its final review stages and will be used as a model for the ANSI draft standard. By pushing the envelope of known human tolerance and developing modern methods to assess the health hazard of repeated jolt, USAARL is serving the developer of Army ground vehicles while protecting the health and safety of the soldier.

Acceleration Injury Assessment: Manikin Research

Health hazards encountered in Army systems include whole-body acceleration and blunt impacts that can produce skeletal and internal soft tissue injuries. One way that the APD assesses these hazards is by using crash manikins that faithfully reproduce the human biodynamic response to impact. Data from these manikins are processed and evaluated to estimate the risk of injury to the exposed soldier when subjected to impact tests such as landmine blasts, parachute opening shocks, repeated jolt, and vertical deceleration. The USAARL injury assessment software (BLAST), initially developed in 1996 for landmine blast injury assessment and subsequently used to evaluate other impact tests, is being made more intuitive and easier to operate. The MIDAS, which was developed at USAARL to improve spinal vertical response, was recently upgraded by replacing the

transducer wiring and on-board data acquisition system. MIDAS was tested at the Civil Aviation Medical Institute (CAMI) along with three other existing manikins (Hybrid III, ADAM, and the new THOR) to compare their spinal responses. Following enhancement to the lumbar load cell, MIDAS will undergo further sled validation testing.

Contracts:

Through sponsorship by the U.S. Army Medical Research and Materiel Command, USAARL maintains an extramural research program in support of its in-house research. These research contractors perform at their own facilities and, in some cases, onsite at USAARL, where unique research tools and facilities can be provided at lower cost to the Army.

Present contract efforts include:

- High-impedance, Dry Physiological Recording Optrode, Phases I and II; SRICO, Inc. Principal investigator – Dr. S. A. Kingsley.

- Contributive Research in Aviation Medicine, Bioengineering, Human Performance, Analytic and Modeling Systems and Data Management, Universal Energy Systems, Inc. Principal investigator - Dr. Thomas Harding.

- Low Cost Virtual Reality System for Monitoring Pilot Performance During Simulated Helicopter Flight, Phase I, System Federal Corporation - Mr. G. Valentino.

Publications:

Open literature publications

Katz, Lawrence C. 1999. Stress and the Medical Aircrew Member. AirMed. 5 (4): 31-34.

Caldwell, John A.; Roberts, Kristi A.; Jones, Heber D. 1999. Simulator Versus In-flight Measurement of Pilot Performance. NATO Research and Technology Organization. (in press)

Caldwell, J. Lynn. 1999. Managing Sleep for Night Shifts Requires Personal Strategies. Flight Safety Foundation Human Factors & Aviation Medicine. 46 (2): 1-11.

Caldwell, J. Lynn; Caldwell, John A. 1999. Recovery Sleep Following 64 Hours of Continuous Wakefulness with Dexedrine. Sleep. 22 (Supp): S297. (Abstract)

Caldwell, John A. 1999. Sleepiness in the Cockpit. The Combat Edge. 8 (3): 4-7.

Caldwell, John A. 1999. Fatigue Facts for Aviators and Everyone Else. Road and Rec. 11 (2): 24-29.

Caldwell, John A.; Prazinko, Brian F. 1999. Body Posture Affects Slow-Wave EEG Activity in Sleep-Deprived Volunteers. Sleep Research Online. 2 (S1): 518.

Caldwell, John A. 1999. Ubermudet am Steuerknuppel (Asleep At The Throttle). Wehrmedizinische Monatsschrift. 8-9 (43): 183. (Rev of brochure)

Caldwell, J. Lynn; Caldwell, John A. 1999. Sleep Architecture Changes Following Sleep Deprivation with Modafinil Compared to Dextroamphetamine. Sleep Research Online. 2 (Sup1): 133. (Abstract)

Lattimore, Morris R. 1999. Case Report: Store Forward Ophthalmic Telemedicine Test to Kuwait. Journal of the American Telemedicine Association. 5 (3): 309-313. (Fall Journal Article)

Lattimore, Morris R.; Crowley, John S. 1999. Closed Cockpit Flight: The U.S. Army AH-64 Experience. NATO RTO Science Publication XX-99.

Lattimore, Morris R.; Kaupp, S.; Schallhorn, S.; Lewis, R. 1999. Orbscan Pachymetry: Implications of a Repeated Measures and Diurnal Variation Analysis. Ophthalmology. 106 (May): 981-989.

Rash, Clarence E.; McLean, William E.; Mozo, Ben T.; Licina, Joseph R.; McEntire, B J. 1999. Human Factors and Performance Concerns for the Design of Helmet-Mounted Displays. Current Aeromedical Issues in Rotary-Wing Operations. 19 (August): 30-1 to 30. (RTO-MP-19)

McLean, William E.; Rash, Clarence E. 1999. Past, Present and Future Night Vision Goggles in U.S. Army Aviation. Current Aeromedical Issues in Rotary-Wing Operations. 19 (August): 32-1 to 10. (RTO-MP-19)

Johnson, Philip A.; Estrada, Arthur; Braithwaite, Malcolm G.; Manning, J C. 1999. Assessment of Simulated Spatial Disorientation Scenarios in Training U.S. Army Aviators. NATO RTO. MP (19): 15-1 15-8.

U.S. Army Aeromedical Research Laboratory--Calendar Year 1999

Technical reports

99-03. **Helmet-Mounted Displays and Facial Injury in U.S. Army AH-64A Apache Accidents.** (Reprint) January 1999. *(ADA359606)*
By John S. Crowley

99-04. **Evaluation of a Standardized Spatial Disorientation Flight Profile**. February 1999. *(ADA361470)*
By Patricia A. LeDuc, Philip A. Johnson, Peggy s. Ruyak, and Arthur Estrada

99-05. **Error Analysis of UH-60 Single Engine Emergency Procedures**. March 1999. *(ADB244789)*
By Robert M. Wildzunas, Richard R. Levine, Walt Garner, and Gary D. Braman

99-06. **Alternate Source Evaluation for the Aircrew Integrated Helmet System Comanche Compatibility Program Phase IIB.** March 1999. *(ADA362293)*
By Clarence E. Rash, Howard H. Beasley, John S. Martin, and Thomas H. Harding

99-07. **Heat Stress Evaluation of Special Operations Aviation Regiment and Air Warrior Concept 1 and 3 Aviator Ensembles in a UH-60 Simulator.** March 1999. *(ADA361526)*
By Matthew J. Reardon, Lawrence C. Katz, and Beth E. Fraser

99-08. **Human Factors and Performance Concerns for the Design of the Helmet-Mounted Displays**. (Reprint). March 1999. *(ADA361527)*
By Clarence E. Rash, William E. McLean, Ben T. Mozo, Joseph R. Licina, and B. Joseph McEntire.

99-09. **Female Hairstyle and Flight Helmet Accommodation: The AMELIA Project Phase I: Survey Study, Part 1: Research Report** March 1999. *(ADA361529)*
By B. Joseph McEntire, Barbara A Murphy, Ben T. Mozo, and John S. Crowley

99-10. **Female Hairstyle and Flight Helmet Accommodation: The AMELIA Project Phase I: Survey Study, Part 2: Survey Responses.** March 1999 *(ADA361528)*
By B. Joseph McEntire, Barbara A Murphy, and Ben T. Mozo

99-11. **An Evaluation of Air Warrior Concept Aviator Ensembles With and Without Microclimate Cooling.** March 1999. *(ADA361991)*
By Lawrence C. Katz, Robert M. Wildzunas, and Bruce S. Cadarette

99-12. **Target Identification Predictor Study: Visual, Cognitive, and Training Variables.** March 1999. *(ADA361986)*
By Richard R. Levine and Robert M. Wildzunas

99-13. **Initial 67th Combat Support Hospital (CSH) Optometry Services in Taszar, Hungary, on Operation Joint Endeavor.** March 1999. *(ADA362004)*
By Dean Bancroft and Morris S. Lattimore

99-14. **Notes on the Calculation of Power in Determining Sample Size and the Construction of Digram-Balanced Designs.** March 1999. *(DTIC number being assigned)*
By Robert M. Wildzunas

99-15. **Evaluating Performance Effects of a Medication (Dexedrine®) in the Simulator Versus Aircraft Environment.** March 1999. *(ADA362972)*
By John A. Caldwell, Kristi A. Roberts and Heber D. Jones

99-16. **A Survey of Work and Sleep Hours of U.S. Army Aviation Personnel.** March 1999. *(ADA362964)*
By J. Lynn Caldwell, Steven R. Gilreath and David N. Norman

99-17. **The Effects of Modafinil on Aviator Performance During 40 Hours of Continuous Wakefulness: A Simulator Study**. June 1999. *(ADA365558)*
By John A. Caldwell, Jr., Nicholas K. Smythe, III, J. Lynn Caldwell, Kecia K. Hall, David N. Norman, Brian F. Prazinko, Arthur Estrada, Philip A. Johnson, John S. Crowley, and Mary E. Brock

99-18. **Concept Phase Evaluation of the Microvision, Inc. Aircrew Intergrated Helmet System HGU-56P Virtual Retinal Display**. August 1999. *(ADA367318)*
By Clarence E. Rash, Thomas H. Harding, John S. Martin, and Howard H. Beasley

99-19. **The Effect of Helmet Mounted Display Field-of-View Configurations on Target Acquisition**. September 1999. *(ADA368601)*
By Victor Klymenko, Thomas H. Harding, Howard H. Beasley, John S. Martin, and Clarence E. Rash

99-20. **A Software Tool for the Design of Multifunction Displays**. September 1999. *(ADA368615)*
By Gregory Francis

2000-01. **Orbscan Pachymetry - Implications of a Repeated Measures and Diurnal Variation Analysis**. October 1999. *(ADA371284)*
By Morris R. Lattimore, Sandor Kaupp, Steven Schallhorn, and Robert Lewis

2000-02. **Aircrew Upper Extremity Reaches While Flying the UH-60 Flight Simulator: Risk of Airbag-Induced Injury**. October 1999. *(ADA371214)*
By John S. Crowley, Amate Vizcaya, B. Joseph McEntire, Philip A. Johnson, and Fred Brozoski

2000-03. (Awaiting printing.)

2000-04. **Flight Evaluation of the Communications Earplug in the OH-58D Helicopter, Part 1. Research Report**. October 1999. *(ADA371212)*
By Barbara A. Murphy and Ben T. Mozo

2000-05. **Flight Evaluation of the Communications Earplug in the OH-58D Helicopter, Part 2. Questionnaire Data**. October 1999. *(ADA371213)*
By Barbara A. Murphy and Ben T. Mozo

2000-06. **Assessment of Simulated Spatial Disorientation Scenarios in Training U.S. Army Aviators** . (Reprint) November 1999. *(ADA371230)*
By Philip A. Johnson, Arthur Estrada, M. G. Braithwaite, and J.C. Manning

2000-07. **U.S. Army Female Aviator Anthropometric, Clothing, and Cockpit Compatibility Study: Demography and Anthropometry of the Study Cohort**
November 1999. *(ADA371606)*
By Claire C. Gordon and Joseph R. Licina

2000-08. **Preliminary Design of an Image Quality Tester for Helmet-Mounted Displays** November 1999. *(ADA371607)*
By Sheng-Jen Hsieh, Clarence E. Rash, Thomas H. Harding, Howard H. Beasley and John S. Martin

2000-09. **The Effects of Sleep Deprivation on Spatial Disorientation**, December 1999. *(ADA372369)*
By Patricia A. LeDuc, Dean Riley, Siobhan M. Hoffman, Mary E. Brock, David Norman, Philip A. Johnson, Ronnie Williamson, and Arthur Estrada

Presentations:

Wildzunas, Robert M.; McLean, William E.; Rash, Clarence E. 1999. External Position Lighting Effects on Night Vision Goggle Performance. Presented at RTO Meeting, Current Aeromedical Issues in Rotary-Wing Operations. 1999 October, San Diego, CA.

McLean, William E.; Rash, Clarence E.; Schmeiser, Elmar. 1999. High Contrast Filters and Their Use in Army Aviation. Presented at SAFE Symposium, 6-8 Dec 1999. 1999 December, Atlanta, GA.

van de Pol, Corina; Corbin, Jacob A.; Hwang, David G.; Klein, Stanley A. 1999. The Effective Optical Zone in Keratorefractive Surgery. Presented at the Cordes Eye Society Meeting. 1999 April, San Francisco, CA.

van de Pol, Corina; Corbin, Jacob A.; Hwang, David G.; Klein, Stanley A. 1999. Size Matters: The Effective Optical Zone and Visual Performance After Keratorefractive Surgery. Presented at the Association for Research in Vision and Ophthalmology Annual Meeting. 1999 May, Ft. Lauderdale, FL.

Salmon, Tom; van de Pol, Corina. 1999. ORBSCAN Accuracy in Measuring Corneal Surface Elevation. Presented at the American Academy of Optometry Annual Meeting. 1999 December, Seattle, WA.

Caldwell, John A. 1999. Monitoring the Status of Helicopter Pilots With Real-Time Electroencephalographic Techniques. Presented to/at the Warfighter Physiological Status Monitoring Conference. 1999 May, Natick, MA.

van de Pol, Corina; Rabin, Jeff. 1999. Visual Performance on the Small Letter Contrast Test: Effects of Aging, Low Luminance and Refractive Error. Presented at NATO/HFM Symposium on Operational Issues of Aging Crew Members. 1999 October, Toulon, France.

Caldwell, John A. 1999. Fatigue Facts for Rotary-Wing Aviators.. Presented to/at International Helicopter Society Meeting. 1999 February, Lafayette, LA.

Caldwell, John A. 1999. Attenuating the Effects of Sleep Deprivation in Aviators Through the Use of Dextroamphetamine and Other Countermeasures. Presented to/at National Academy of Sciences Workshop on Caffeine Formulations for Sustainment of Mental Task Performance in Military Operations. 1999 February, Washington, DC.

Caldwell, J. Lynn. 1999. Napping Strategies to Counteract Sleep Deprivation. Presented to/at NATO RTO HFM Panel Workshop on Individual Differences in the Adaptability to Irregular Rest/Work: Status of the Use of Drugs in Sleep/Wakefulness Management. 1999 June, Venice, Italy.

Caldwell, John A. 1999. Efficacy of Dextroamphetamine for Sustaining Aviator Alertness and Performance Throughout 64 hours of Continuous wakefulness. Presented to/at the Associated Professional Sleep Societies. 1999 June, Orlando, FL.

Caldwell, John A. 1999. The Effectiveness of Amphetamines Versus Modafinil for Sustaining the Performance of Army Aviators. Presented to/at the Combined Enviromental Medicine/Operational Aeromedical Problems Course. 1999 May, Lafayette, LA.

Caldwell, John A. 1999. Dexedrine Effectively Sustains Aviator Performance in 64-hour Periods of Continuous Wakefulness. Presented to/at the Aerospace Medical Association. 1999 May, Detroit, MI.

Caldwell, John A. 1999. The Use of Amphetamines in Military Operations: Efficacy, Safety, and the Effects of Individual Differences. Presented to/at the NATO Research and Technology Organization, Human Factors and Medicine Panel Workshop on Individual Differences in the Adaptability to Irregular Rest-work Rhythms/Status of the Use of Drugs in Sleep-wakefulness. 1999 June, Venice, Italy.

Caldwell, John A. 1999. The Efficacy of Modafinil and Dextroamphetamine for the Sustainment of Aviator Performance in Long-duration Operations. Presented to/at the Army Medical Research and Development Command Army After Next Conference. 1999 June, McLain, VA.

Caldwell, John A. 1999. Sustainment of Aviator Performance and Real-time Monitoring of Pilot Status. Presented to/at NASA Ames Fatigue Countermeasures Division. 1999 April, Moffet Field, CA.

Caldwell, J. Lynn; Caldwell, John A. 1999. Recovery Sleep Following 64 Hours of Continuous Wakefulness with Dexedrine. Presented to/at 13th Annual Meeting of the Associated Professional Sleep Societies. 1999 June, Orlando, FL. (Poster)

Caldwell, J. Lynn; Caldwell, John A. 1999. Sleep Architecture Changes Following Sleep Deprivation With Modafinil Compared to Dextroamphetamine. Presented to/at the Third International Congress of the World Federation of Sleep Research Societies. 1999 October, Dresden, Germany. (Poster)

Caldwell, John A. 1999. Fatigue Facts for Flight Surgeons. Presented to/at U.S. Army School of Aerospace Medicine. 1999 July, Fort Rucker, AL.

Caldwell, John A. 1999. Fatigue Management in the Aviation Environment. Presented to/at the Aviation Precommand Course. 1999 August, Fort Rucker, AL.

Caldwell, John A. 1999. Fatigue Facts for Aviation Psychologist. Presented to/at U.S. Army School of Aerospace Medicine, Aviation Psychologist Course. 1999 October, Fort Rucker, AL.

Caldwell, John A. 1999. Body Posture Affects Slow-wave EEG Activity in Sleep-deprived Volunteers. Presented to/at Third International Congress of the World Federation of Sleep Research Societies. 1999 October, Dresden, Germany.

Lattimore, Morris R.; Schallhorn, S.; Kaupp, S.; Lewis, R. 1999. Bandage Soft Contact Lens Barrier Function. Presented at Annual Meeting of the American Academy of Optometry. 1999 December, Seattle, WA.

Lattimore, Morris R.; Schallhorn, S.; Lewis, R.; Kaupp, S. 1999. PRK Implications of a Corneal Diurnal Variation Analysis. Presented at AsMA. 1999 May, Detroit, MI.

Lattimore, Morris R.; Crowley, John A. 1999. Closed Cockpit Flight in the U.S. Army: The AH-64 Experience. Presented at NATO RTO Science Meeting. 1999 April, Antalya, Turkey.

Lattimore, Morris R. 1999. Store Forward Ophthalmic Telemedicine Test to Kuwait. Presented at Annual Meeting of the American Telemedicine Association. 1999 April, Salt Lake City, UT.

Lattimore, Morris R. 1999. Store Forward Ophthalmic Telemedicine Test to Kuwait. Presented at the International Consortium on Ocular Telehealth. 1999 April, Salt Lake City, UT.

Lattimore, Morris R. 1999. USAARL Ophthalmic Telemedicine Initiatives. Presented at Advanced Biotechnical Consortium Meeting at Claremont College. 1999 March, Claremont, CA.

Licina, Joeseph R.; Rash, Clarence E.; Mora, John C.; Ledford, Melissa L. 1999. Helmet-mounted Display Human Factors Engineering Design Issues: Past, Present, and Future. Presented at Helmet and Head-Mounted Displays IV, SPIE AeroSense Conference. 1999 April, Orlando, FL.

Crowley, John S.; Johnson, Phillip A.; Ledford, Millisa L.; Rash, Clarence E. 1999. HMD Degraded Visual Environment Simulator. Presented at Helmet and Head-mounted Displays IV, SPIE AeroSense Conference. 1999 April, Orlando, FL.

McLean, William E.; Rash, Clarence E. 1999. Past, Present and Future Night Vision Goggles in U.S. Army Aviation. Presented at RTO Meeting of Current Aeromedical Issues in Rotary-Wing Operations. 1999 October, San Diego, CA.

Rash, Clarence E. 1999. Lessons Learned from AH-64 Monocular Helmet-mounted Display. Presented to British Army Flight Surgeons at Headquarters, Army Aviation. 1999 September, Middle Wallop, UK.

Technical Memoranda:

Subject: HHA on M1114 HMMWV ECV, Project No. 69-37-6921-99
Customer: U.S. Army CHPPM

Subject: Revised Whole-Body Vibration HHA Report on XM1114 HMMWV (ECV) Using Different Mission Scenarios
Customer: U.S. Army CHPPM

Subject: HHA Report on the M915A4 Truck Tractor
Customer: U.S. Army CHPPM

Subject: HHA of WBV for Hydraulic Excavator
Customer: U.S. Army CHPPM

Subject: 18-Month Review of FM 1-100, Army Aviation Operations
Customer: DOTDS

Subject: Laboratory Analysis of the Forerunner Automatic External Defibrillator (Model EM)
Customer: Heartstream, Inc.

Subject: Vibration Test Parameters
Customer: Air Force Research Laboratory/Human Engineering Program

Subject: Whole-Body Vibration Health Hazard Assessment--Advanced Amphibian Assault Vehicle
Customer: U.S. Army CHPPM

Subject: Review of Appendix M, Digitization, FM 1-111, Aviation Brigades
Customer: DOTDS

Subject: Review of ORD for Joint Service Aircrew Mask MS II
Customer: USAMMDA

Subject: Joint Aircrew Protective Ensemble ORD
Customer: MRMC

Subject: Laboratory Analysis of the Vital Signs Monitor (Model 90309)
Customer: SpaceLabs Medical

Subject: Preliminary Injury Evaluation of the Cockpit Airbag System
Customer: PM-ACIS

Subject: Aeromedical Evaluation of the UH-60 Cockpit Airbag System
Customer: PM-ACIS

Subject: Aircraft Accident Investigation ALSERP Analysis of USASC Case 990129011
Customer: U.S. Army Safety Center

Subject: Assessment of BASIC P31 Helmet Weight
Customer: U.S. Army Soldier and Biological Chemical Command

Subject: Crashworthiness Assessment of a Proposed Design Change to the TH-67 Seat Pan
Customer: DynCorp

Subject: Test Plan Out-of-Position and Inadvertent Deployment OH-58D Cockpit Airbag System
Customer: PM-ACIS

Subject: Abbreviated Crashworthiness Assessment of the Light Weight Motor Blower
Customer: AMCOM

Subject: Abbreviated Optical Evaluation of Laser Visors for HGU-56/P
Customer: PM-ACIS

Subject: Abbreviated Evaluation of Visors for HGU 56/P
Customer: PM-ACIS

Subject: NVG Compatibility Testing of Colored Displays at BGAD, KY
Customer: AVRDECR, Redstone Arsenal, AL

Subject: Test Results from the Study Entitled "An Evaluation of Mixing the OMNIBUS II and OMNIBUS IV (Ultra) ANVIS in the Same Cockpit"
Customer: PM-NVRSTA

Subject: Preliminary Results, Evaluation of Objective Lenses for ANVIS-9
Customer: PM NV/RSTA

Subject: Informal Evaluation of the Panoramic Night Vision Goggles, Version II, Serial No. 0001
Customer: NV/ESD: ATTN: AMSL-RD-NV-ASB

Subject: Review of Appendix D, Digitization, FM-100, Army Aviation Operations
Customer: DOTDS

Subject: Report on ALSERP Case No. 97-09
Customer: U.S. Coast Guard, ATC Mobile, AL

Subject: ALSERP Analysis of U.S. Army Safety Center Accident Case 99-06
Customer: U.S. Army Safety Center

Subject: ALSERP Analysis of U.S. Army Safety Center Accident Case 990407001
Customer: U.S. Army Safety Center

Subject: ALSERP Analysis of U.S. Army Safety Center Accident Case 990407001
Customer: U.S. Army Safety Center

Subject: ALSERP Analysis of U.S. Army Safety Center Accident Case 98121116
Customer: U.S. Army Safety Center

Consultations:

Subject: Communication Earplug
Customer: Federal Bureau of Investigation

Subject: Communications Earplug (CEP)
Customer: Defence and Civil Institute of Environmental Medicine

Subject: VIS (Vehicular Intercommunication System)
Customer: U.S. Army CHPPM

Subject: Behind Armor Effect - Helmet
Customer: U.S. Army Natick RD&E Center

Subject: CABS Qualification Tests
Customer: PM Aircrew Integrated Systems, AMCOM

Subject: Qualification Tests of CABS at Simula
Customer: PM Aircrew Integrated Systems, AMCOM

Subject: WBV in Bobcat Loader
Customer: DTC - Aberdeen Proving Ground

Subject: CABS Tests Evaluation
Customer: PM-ACIS

Subject: AWR for Medical Devices
Customer: Fort Gordon, GA, MEDAC

Subject: Fatigue Brochure
Customer: DynCorp

Subject: National Sleep Awareness Week
Customer: Army Flyer

Subject: USA Today/National Sleep Foundation Hotline
Customer: National Sleep Foundation

U.S. Army Aeromedical Research Laboratory--Calendar Year 1999

Subject: Press Conference for National Sleep Awareness Week
Customer: WTVY, WDHN, Dothan Eagle, WKMX, Sun Courier

Subject: Amphetamine for Sustained Ops
Customer: U.S. Army Special Operations Command

Subject: Amphetamines to Sustain Performance
Customer: U.S. Army Special Operations Command

Subject: Stimulants to Sustain Aviator Performance
Customer: Brooks Air Force Base

Subject: Side Effects of Modafinil
Customer: Brooks Air Force Base

Subject: Fatigue Management in Aviation Operations
Customer: Langley Air Force Base

Subject: Stimulant Use in Aviation Sustained Operations
Customer: Fort Gordon, GA, MEDAC

Subject: Stimulant Use in Aviation Operations
Customer: Brooks Air Force Base

Subject: Heat Stress and Aviator Endurance
Customer: USARIEM

Subject: Effects of Heat Stress on EEG Activity
Customer: U.S. Army Special Operations Command

Subject: Statistical Consult
Customer: ARCCA, Philadelphia, PA

Subject: Request for Information on Aviator Fatigue
Customer: U.S. Army Special Operations Command Surgeon

Subject: Sustained Operations/Fatigue Policy Review Working Group
Customer: Air Force Air Combat Command

Subject: Future Directions for Air Force Work on the Stimulant Modafinil
Customer: Air Force Research Laboratory/Human Engineering Program

Subject: Statistical Consultation
Customer: ARCCA, Philadelphia, PA

Subject: Use of Modafinil to Sustain Aviator Performance
Customer: Brooks AFB Aeromedical Consult Service

Subject: Adjustment to Jet Lag and Shift Work
Customer: 12th Aviation Brigade

Subject: Leader's Guide to Crew Endurance
Customer: Office of Disease Prevention and Health Promotion

Subject: Napping on Long-haul Flights
Customer: 92nd Medical Group, Fairchild AFB, WA

Subject: Jet Lag Coping Strategies
Customer: U.S. CENTCOM

Subject: Fatigue/Work Shift Problem in Helicopter Pilots
Customer: Texaco Aviation Transport Service

Subject: Hypnotic and Melatonin Use for Deployment
Customer: Air Force Research Lab, Brooks AFB

Subject: Zolpidem Information
Customer: Australian RAAF Base Edinburgh

Subject: USASC Ground Accident Consultation
Customer: U.S. Army Safety Center

Subject: Collapsible Cyclic Stick
Customer: Sikorski Aircraft, Stratford, CT

Subject: CABS OH-58D Consult
Customer: DCD Army Aviation Branch, Integration Manager

Subject: M48 Mask HF Compatibility
Customer: AMCOM

Subject: Health Hazard Assessment of the XM1114
Customer: TRADOC

Subject: SOP for the XM1114
Customer: TACOM

Subject: HHA XM1114
Customer: TRACOC

Subject: Noise Attenuation and Hearing Protection.
Customer: U.S. Army Safety Center

Subject: Aircraft Cockpit Noise Measurements
Customer: ATTC

Subject: Military Operation In Urban Terrain (MOUT)
Customer: Dismounted Battle-lab, Task Force 21, Fort Benning, GA

Subject: TENOR Meeting and CEP Presentation
Customer: Tri-service Enhanced Noise Reduction (TENOR) Working Group

Subject: Noise Levels in the UH-60
Customer: New Hampshire National Guard

Subject: CEP Briefing for MG Parker at AMEV IPR
Customer: USAMMDA, Fort Detrick, MD

Subject: Noise Levels in the Blackhawk Helicopter
Customer: U.S. Army Surgeon General

Subject: Hearing Protectors for Use in the Blackhawk Helicopter (Earmuffs)
Customer: U.S. Army Surgeon General

Subject: Illesheim Apache Alert
Customer: 67th CSH

Subject: Korea-Contact Lens Info Request
Customer: 121st Hospital, Seoul, Korea

Subject: Vision Standards
Customer: OTSG Optometry Consultant

Subject: Aviation Vision Standards
Customer: OTSG Optometry Consultant

Subject: Reading Loupes --- Assorted Uses in the Apache
Customer: British Army

Subject: U.S. Army Contact Lens Policy
Customer: British Army

Subject: SLCT Marketing
Customer: OTSG Optometry Consultant

Subject: International Consortium on Ocular Telehealth
Customer: American Telemedicine Association

Subject: Vision Screening Standards
Customer: U.S. Army CHPPM

Subject: Advanced Technology
Customer: TATRC

Subject: Bifocals in the Cockpit
Customer: NAMRL

Subject: SLCT Marketing
Customer: OTSG Optometry Consultant

Subject: Refractive Error Prevalence
Customer: Hassad College

Subject: Effects of Altitude on Stability of LASIK Refractive Surgery
Customer: U.S. Navy Refractive Surgery Center - San Diego, CA

Subject: Apache Contact Lens Program
Customer: 1-151 Attack Battalion

Subject: Draft Proposal on Keratoconus Topography and Pachymetry
Customer: TATRC

Subject: Unit Research Coordination
Customer: NMCSD

Subject: Refractive Surgery
Customer: National Guard Safety Bureau

Subject: Deployment-related Vision Requirements
Customer: U.S. Army CHPPM

Subject: Pike's Peak Altitude Effects on Refractive Surgery Study
Customer: Navy Medical Center - San Diego, CA

Subject: Aviation Contact Lens Program
Customer: 67th Combat Support Hospital, Wurzburg, Germany

Subject: SD 2 Study
Customer: University of Illinois

Subject: WOMBAT Outcome from SD Study
Customer: AERO Inc.

Subject: Redo SD Sorties from UH-1 to UH-60
Customer: USAASAM

Subject: Medical Equipment Use Onboard Helicopters
Customer: 121st Hospital, Seoul, Korea

Subject: Cold Weather Testing Requirements for UH-60Q
Customer: AMCOM, PM Utility Helicopters, UH-60Q

Subject: Hydra Rocket HCL Concerns
Customer: ATTC, TECOM, Fort Rucker, AL

Subject: Anthros and Army Helicopters
Customer: Aviation Branch Safety Office

Subject: Flame/Thermal Threats to Aviation Crewmembers
Customer: U.S. Army Natick RDT&E Center

Subject: HGU-56/P Helmet Acquisition - Fort Rucker
Customer: U.S. Army Aviation Center and School

Subject: Infant Transport Incubator
Customer: MEDCOM/MRMC

Subject: Medical Component Items for SARVIP
Customer: Illinois Army National Guard, National Guard Bureau

Subject: Ground Water Contamination
Customer: Fort Rucker Office of Environmental Management

Subject: UH-60Q OBOGS Issues
Customer: UH-60Q Program AMCOM, Utility Helicopter PM, UH-60Q Program Manager

Subject: Risk Assessment Issues for Medical Equipment
Customer: USAMMA

Subject: CEP Testing Parameters
Customer: AMCOM, PM HGU-56/P

Subject: AWR Program
Customer: Aviation Medical Officer USCG Air Station, Miami, FL

Subject: CRDA Partner Inquiry
Customer: Heartstream, Inc.

Subject: AH-64 Helmet Sizing
Customer: Centre for Human Sciences, Farnborough, UK

Subject: Request for Information on Transport Ventilators
Customer: Women's College Health Sciences Center Base Hospital Program

Subject: M-48 Arm Mounted Motor Blower Safety Release
Customer: AMCOM, PM ACIS, Air Warrior

Subject: AMEV Safety Assessment Report
Customer: USASC

Subject: Incubators for MEDEVAC
Customer: Fort Irwin MEDDAC

Subject: Aviator Helmet Design
Customer: Intamar Logistics

Subject: UH-60Q Medic Seat Energy Attenuation
Customer: Unknown

Subject: Injury Data and the Breakaway Cyclic Design
Customer: Sikorski Aircraft, Trumbull, CT

Subject: Laser Protection from Visible and Near IR Wavelengths with NVGs
Customer: 160th SOAR, Fort Campbell, KY

Subject: Annual Night Vision Working Group Meeting
Customer: USAAVNC

Subject: Laser Protection
Customer: HQ USAEUR Safety Group

Subject: Laser Protection with NVGs Using Modified SWD Goggle Faceplate
Customer: 160th SOAR, Ft. Campbell, KY

Subject: NVG Accident Investigation Information
Customer: USASC

Subject: Eye Clearance with ANVIS for MBU-19 Protective Mask
Customer: 160th SOAR, Fort Campbell, KY

Subject: Testing of Image Intensification Systems
Customer: ATTC

Subject: Suggested Changes to Draft DA PAM 40-506, Army Vision Conservation and Readiness Program
Customer: U.S. Army CHPPM

Subject: Compatibility of Colored Displays with NVGs - Briefing, Demonstrations, and Simulation
Customer: AMCOM

Subject: Corrective Lens for M40 Protective Mask
Customer: PM NBC

Subject: Eye Dominance Tests
Customer: ASC/SMH, Wright Patterson AFB

Subject: M45 Corrective Lens Insert
Customer: PM-NBC

Subject: Flat Panel Display in AH-64D Apache
Customer: ATTC

Subject: Engineering Change Proposal (ECP), HGU-56/P Helmet Visor
Customer: AMCOM

Subject: M45 Mask Insert
Customer: PM NBC

Subject: Colored Night Vision System Evaluation
Customer: CANVS and PM Night Vision

Subject: Evaluation of NVG Compatibility of Colored Flat Panel Display
Customer: AMCOM

Subject: Yellow Visors for HGU-56/P Helmet
Customer: HHC 1-223rd Aviation Battalion

Subject: Review of Research Optometrist Qualifications and GS Ratings
Customer: OTSG

Subject: Night Vision Goggle Consultation
Customer: 147th FW, Air National Guard, South Dakota

Subject: NVG Video Recordings
Customer: A Company, 20th Special Forces Group, 1st Special Forces

Subject: Review Submitted to ASMA
Customer: Aerospace Medical Association

Subject: Protocol Review
Customer: HRED

Subject: Microvision Laser HMD
Customer: Microvision

Subject: Laser Helmet-Mounted Display
Customer: Sikorski Aircraft, Trumbull, CT

Subject: High Contrast Visors
Customer: Illinois Army National Guard

Subject: Lunar Calendar
Customer: Australian Defence Force Helicopter School

Subject: Review of FAA Guideline for Cockpit Design
Customer: FAA

Subject: Compact High Throughput Optics
Customer: PM-ACIS/Honeywell, Inc.

Subject: HEEDS Placement on SRU-21P
Customer: 5/158 AVN BN

Subject: ALSERP
Customer: Alabama National Guard

Subject: Helmet Fit Lab
Customer: Fort Leavenworth, KS

Subject: ALSERP Site Visit/Trip Report, CW5 Thomas, Korea Class A
Customer: U.S. Army Safety Center

Subject: ALSERP
Customer: Maryland National Guard (Aviation)

Subject: Thermal Protection for Service Members
Customer: HQ, V Corps, Germany

Subject: KEVLAR Helmet
Customer: U.S. Army Safety Center

Subject: PRC 90 Survival Radio
Customer: 12th AVN BDE

Subject: Helmet Fit Program
Customer: NHNG

Subject: HGU Problems
Customer: PM-ACIS

Subject: ALSE
Customer: 17th Aviation, Korea

Subject: LASIK
Customer: NAMRL

Subject: Deployable Optometry/Optician Set
Customer: SOCOM

Subject: Army Optometry's Role in Monitoring of PRK/LASIK
Customer: Army Optometry

Subject: Contact Lenses for UH-60 pilots
Customer: Army Optometry

Subject: Waiver for PRK for Army Aviation Candidate
Customer: Eastern ARNG Aviation Training Site

Subject: Cutaway Frames for Apache Pilots (British Army)
Customer: British Army

Subject: PRK and Aviator Candidacy
Customer: Eastern ARNG Aviation Training Site

Teaching Services:

Subject: Sleep and Sustained Performance in Aviation
Customer: Aviation Precommand Course

Subject: Lecture on Aviation Fatigue and Countermeasures
Customer: USASAM

Subject: Management of Fatigue in Aviation Operations
Customer: Aviation Precommand Course

Subject: Managing Fatigue in Aviation Operations
Customer: USASAM

Subject: Sleepiness and Fatigue in the Aviator
Customer: USASAM

Subject: Excessive Daytime Sleepiness and Sleep Disorders
Customer: Journal Club, USAAMC, Fort Rucker, AL

Subject: NVG Present and Future, Laser Safety and Other Issues
Customer: 1st/212 Aviation Regiment

Subject: ALSE Presentation
Customer: ASOC

Subject: ALSE
Customer: U.S. Army Safety Center

Subject: ALSE
Customer: PM-ACIS

Field Services:

Subject: ALSERP Site Visit/Trip Report, CW5 Thomas, Korea Class A
Customer: U. S. Army Safety Center

Committees:

Aerospace Medical Association		
U.S. Army Aviation Medical Association	President	LTC J. S. Crowley
	Member	COL John A. Powell
Scientific Program Committee	Member	COL John L. Powell
	Member	Dr. K. A. Kimball
	Member	LTC J.S. Crowley
Aerospace Human Factors Association	Member	Dr. K. A. Kimball
	Member	Dr. P. A. LeDuc
Ad Hoc Human Factors Committee	Member	Dr. K. A. Kimball
	Member	CPT L. C. Katz
Registration Committee	Member	CPT L. C. Katz
Federal Laboratory Consortium	Member	Ms. D. L. Hemphill
American National Standards Institute		
Z90.1 Helmet Committee	Member	Mr. B. J. McEntire
American Board of Preventive Medicine	Member	LTC J. S. Crowley
Aerospace Medicine Board Examination Writing Committee	Member	LTC J. S. Crowley
Department of Defense		
Joint Service Display Panel Subpanel on Display Devices	Member	Mr. C. E. Rash
Human Factors Engineering Technical Advisory Group (Triservice)	Member	Dr. K. A. Kimball
	Member	CPT L. C. Katz
National Safety Council Executive Board, Aerospace Division	Member	Mr. J. R. Licina
Triservice Aeromedical Research Panel (TARP)	Member	COL John A. Powell
	Alternate	Dr. K. A. Kimball
Triservice Vision Technical Working Group (TARP)	Chairman	COL M. R. Lattimore, Jr.

Triservice Refractive Surgery Group Important Medications Working Group	Member	COL M. R. Lattimore, Jr.
Technical Working Group in Situational Awareness and Spatial Disorientation	Member	LTC Philip A. Johnson
Triservice Aviator Helmet Standardization Working Group	Member Member	Mr. J. R. Licina Mr. B. J. McEntire
Triservice Enhanced Noise Reduction (TENOR)	Member	Ms. E. Gordon
Joint Cockpit Airbag System Working Group	Member	Mr. B. J. McEntire
Triservice Biodynamics Working Group	Chairman Member	Mr. B. J. McEntire Dr. N. M. Alem
Joint Service General Purpose Mask Working Group	Member (Non-Voting) Member	Dr. W. E. McLean MAJ C. van de Pol
National Sleep Foundation Speaker Bureau	Member	Dr. J. A. Caldwell
National Sleep Foundation Science Advisory Council	Member	Dr. J. A. Caldwell
Triservice Working Group on Helmet Mounted Displays	Member	Mr C. E. Rash
Aircrew Integrated Working Group for Helmet Mounted Displays	Member	Mr. C. E. Rash
Sustained Operations/Fatigue Policy Review Working Group, USAF	Member Member	Dr. J. A. Caldwell Dr. J. Lynn Caldwell
Department of the Army		
Comanche IPT on Helmet Mounted Displays	Member	Mr. C. E. Rash
USA ALSE Steering Council	Member	Mr. J. R. Licina
Life Support Equipment Steering Committee	Member	Mr. J. R. Licina

RAH-66 Comanche	Member	Mr. J. R. Licina
UH-60Q System Safety Working Group	Assoc. Member	Mr. J. R. Licina
Air Warrior System Safety Working Group	Assoc. Member Assoc. Member Assoc. Member	Mr. J. R. Licina Mr. B. J. McEntire LTC J. S. Crowley
Joint Aircrew Executive Steering Council (JAESC)	Member	Mr. B. J. McEntire
Team Air Warrior Management Working Group	Assoc. Member	Mr. J. R. Licina
AH-64 and Longbow System Safety Working Group	Member	Mr. J. R. Licina
Kiowa Warrior, OH-58D, and MPLH System Safety Working Groups	Member	Mr. J. R. Licina
XM-45 Aircrew Protective Mask Test Integration Working Group	Member	Dr. W. E. McLean
HGU-56/ P Comanche Compatibility Development Program	Member	Mr. C. E. Rash
U.S. Army Aviation Contact Lens Policy Working Group	Co-Chairman	COL M. R. Lattimore, Jr.
Advanced Laser Protection System (ALPS) Working Group	Member	Dr. W. E. McLean

U.S. Army Aviation Center

Life Support Equipment Steering Committee	Member	Mr. J. R. Licina
U.S. Army Aeromedical Consultant Advisory Panel, USAAMC	Member Member Member Member Member	COL John A. Powell COL M. R. Lattimore, Jr. LTC J. S. Crowley LTC J. Campbell MAJ C. van de Pol
Night Vision Goggle Working Group	Member	Dr. W. E. McLean
Black Employment Program Committee	Alternate	Ms. E. Gordon

Equal Employment Opportunity Committee	Coordinator	Ms. E. Gordon

International Committees

NATO Research and Technology Organization

Aircrew Integration Working Group	Member	Mr. C. E. Rash
International Consortium on Ocular TeleHealth	Founding Member	COL M. R. Lattimore, Jr.

The Technical Cooperation Program

Subgroup U, UTP-7, Human Factors in Aircraft Environments	Army Representative	LTC J. S. Crowley
Working Technical Panel (WTP) 1 Key Technical Area (KTA) 1-29 Protection of Wheeled Vehicle Occupants from Landmine Effects	Member	Dr. N. M. Alem

Journal Review Board

Military Medicine	Reviewer Reviewer	COL M. R. Lattimore, Jr. LTC J. S. Crowley
Aviation, Space, and Environmental Medicine	Reviewer Reviewer Reviewer	COL M. R. Lattimore, Jr. Dr. K. A. Kimball LTC J. S. Crowley